

NATCO Annual Meeting – August 12, 2007
Marriott Marquis Times Square, NYC

Revising U.S. Kidney Allocation Policy: Progress Toward a New Approach

OPTN/UNOS Kidney Transplantation Committee

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Senior Vice President, New England Organ Bank
Kidney Allocation Review Subcommittee Member

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Outline

- Why are we reviewing kidney allocation?
- What has been the process?
- What are likely changes?
- When will changes be implemented?

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Allocation Policy Development

Federal Govt. passed NOTA creating the OPTN/UNOS

- Dept of Health and Human Services (HHS) → HRSA → UNOS contract
- OPTN/UNOS Board → Kidney Committee → KARS

Allocation Policy Development is a back-and-forth process in which public comment is mandatory

The policy development process has seven steps:

1. A committee develops policy proposals using data analysis provided by the UNOS research staff, the SRTR, and other supporting information.
2. The committee prepares and distributes an initial briefing paper including the rationale surrounding the proposed policies.
3. The committee receives public comments on the proposed policies and makes any appropriate changes to the proposal.
4. The committee adds its responses to the public comments and final recommendation to the briefing paper and submits it to the Board of Directors.
5. The Board votes on the proposed policy.
6. If approved, the Board submits the policy to the Secretary of Health and Human Services for comment/approval.
7. If approved by the Secretary, the proposed policy is implemented. If not approved, the policy is returned to the Board or the committee as appropriate.

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OPTN Final Rule

Allocation policy development should:

- “seek to achieve the best use of donated organs”
- Be “designed to avoid wasting organs”
- Set “priority rankings through objective and measurable medical criteria”
- *De-emphasize the use of waiting time in rank ordering candidates*

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Who worked on this review?

- | | |
|--|--|
| 1. Mark D. Stegall, M.D., Chair, Rochester, MN | 10. Alan B. Leichtman, M.D., Ann Arbor, MI |
| 2. Margo L. Akerman, MS, Knoxville, TN | 11. Ruth A. McDonald, M.D., Seattle, WA |
| 3. Clyde F. Barker, M.D., Philadelphia, PA | 12. Kevin J. O'Connor, MS, PA, Newton, MA |
| 4. Bryan N. Becker, M.D., Madison, WI | 13. Janis M. Orlowski, M.D., Washington, D.C. |
| 5. Fernando Cosio, M.D., Rochester, MN | 14. Laura St. Martin, M.D., MPH, Rockville, MD |
| 6. Dale A. Distant, M.D., Brooklyn, NY | 15. Milton Sander, III, RN, New Orleans, LA |
| 7. Mark Fox, M.D., PhD, Oklahoma City, OK | 16. Mark A. Schnitzler, Ph.D., St. Louis, MO |
| 8. Daniel H. Hayes, M.D., Charlotte, NC | 17. Peter G. Stock, M.D., Ph.D., San Francisco, CA - Current Chair |
| 9. Mary S. Leffell, PhD, Baltimore, MD | 18. Winfred Williams, M.D. Boston, MA |
| | 19. James J. Wynn, M.D., Augusta, GA |

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Later additions

Regional Representatives:

- Region 1: Robert L. Madden, M.D.
- Region 2: Michael E. Shapiro, M.D.
- Region 3: Thomas C. Pearson, M.D., Ph.D.
- Region 4: Francis H. Wright, Jr., M.D.
- Region 5: Stephan Busque, M.D.
- Region 6: Christian S. Kuhr, M.D.
- Region 7: Dixon B. Kaufman, M.D., Ph.D.
- Region 8: John L. Smith, M.D.
- Region 9: Stuart M. Greenstein, M.D.
- Region 10: Jonathan A. Fridell, M.D.
- Region 11: Paul F. Gores, M.D.

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Simulations

- Bob Wolfe, SRTR
- Keith McCullough SRTR
- Alan Leichtman, SRTR
- Gregory Fant, HRSA

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What is the process?

- 360° review—done
- Considering new approaches
- Computer modeling/simulations of alternative approaches
- Finalize new proposal
- Public Comment/Revisions
- Final UNOS/OPTN Board approval

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When Did This Process Begin?

The Kidney Allocation Review Sub-Committee (KARS) was created, and started the process of revising US kidney allocation policy, in the fall of 2004...

Almost three years ago...

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Work Performed To Date...

- 360° review of all facets of kidney transplantation – public hearings on 11 topics
- 4 KARS meetings (1.5 days) each year
- Multiple simulated allocation “runs” based on KARS meeting deliberations
- Continuous process of reviewing data and refining / shaping proposal
- Multiple presentations to various groups – regular updates at UNOS Regional meetings
- Public Forum – February 2007

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360° Review of Current Allocation System

- Scope of ESRD
- Ethical Issues
- Barriers to Access Issues
- OPO Issues
- Introduction to New Allocation Systems
- Histocompatibility Issues
- Patient Issues
- Minority Issues
- Specific Biologic Issues Such as Those of Diabetes
- Net Benefit Model
- Transplantation in Other Countries

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Computer modeling/simulations of alternative approaches: KPSAM

- Pursuant to the OPTN Kidney Committee's request, the SRTR has prepared the Kidney-Pancreas Simulated Allocation System (KPSAM) to simulate various strategies for allocation.

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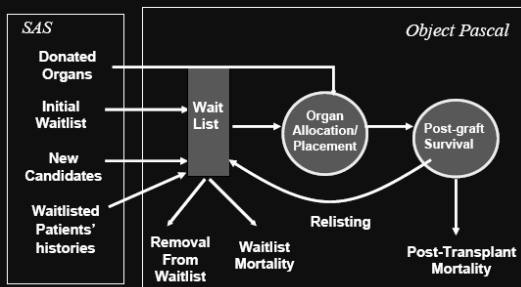
What is the Kidney and Pancreas Simulation Allocation Model (KPSAM)?

- KPSAM is a sophisticated computer program that can
 - replicate the results of the current kidney allocation system
 - predict the consequences of proposed policy changes before they are instituted
 - allow comparisons between alternative allocation rules or algorithms

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KPSAM Simulations Process Events in Time Order



KPSAM “Runs”

- Run 1: Current national allocation system
- Run 2: “No interleave” – separate allocation categories for adult and pediatric candidates
- Run 3: LYFT in place of kidney points for adult candidates of SCD organs
- Run 4: No paybacks – the payback system is eliminated
- Run 5: No OMM sharing – the priority for shared OMM organs is eliminated
- Run 6: Eliminate OMM priority locally for adult candidates of SCD organs.
- Run 7: No KP priority – KP and KI candidates compete by LYFT. Do this for adult candidates for SCD organs.

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KPSAM “Runs”

- Run 8: A2-B
- Run 9: OMM Sharing for PRA 80+ adult candidates for SCD organs
- Runs 10: LYFT + X * ESRD years (X = 1, 2) (*Note: this run is superseded by run 12*)
- Run 11: National allocation, no geographic boundaries.
- Run 12: Allocate by LYFT + X * ESRD time (with X small) (start by modifying LYFT to be
 - unchanging from listing, then add 0.1, 0.2, 0.5, 1).
- Run 13: Allocate by LYFT - X * waitlist lifetime, with X = 0.2.
- Run 14: Allocate by LYFT + X * PRA, with X = 0.01.
- Run 15 No HLA A+B (based on run 9)

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KPSAM “Runs”

- Run 16 Dgn PKD + DM (based on run 15)
- Run 17 Dgn DM only (based on run 16)
- Run 18 Continuous DPI (based on run 17)
- Run 19 PRA*4 pts (based on run 18)
- Run 20 Discounting (based on run 18) (*Note: Not completed*)
- Run 21 Quintiles (based on run 17)
- Run 22 Continuous age matching (based on run 17)
- Run 23 Wait-time + changes (based on run 1) (*Note: Not completed*)
- Run 24 LYFT + 0.5*ESRD time, kidney follows pancreas (based on run 12, but with LYFT as in run 16)

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Important Caveats

- The final proposal has not been developed as of yet
- Even after a final proposal is implemented, there will be ongoing changes (e.g. MELD policy revisions based on ongoing analysis)

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What is the current system of kidney allocation?

What can be improved?

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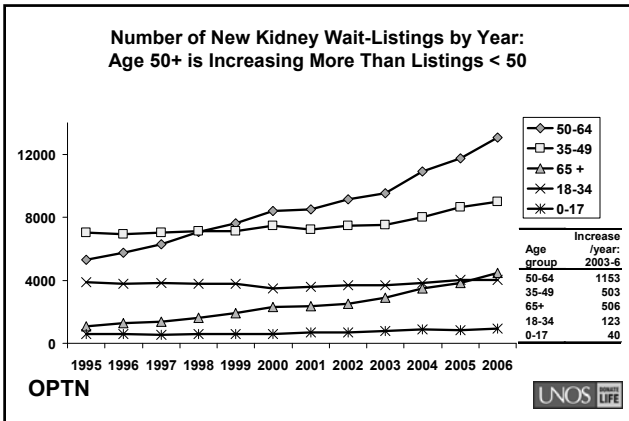


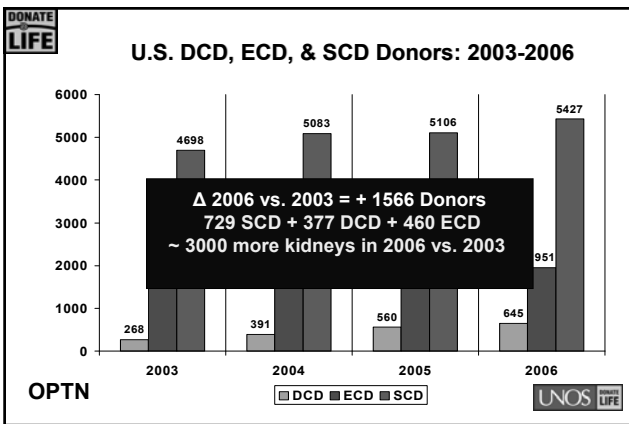
Deceased Donor Kidney Waiting List

- 68,902 candidates for kidneys
 - 66,402 solitary kidney
 - 2500 simultaneous pancreas-kidney
- 2006 Kidney Transplants
 - 17,379 total
 - 10,816 deceased donors
 - 9914 solitary kidneys
 - 902 SPK
 - 6663 living donor (doubled over 15 years)

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The current system

- Waiting time (1 point/year)
- HLA matching (2 points for DR)
- Sensitization (4 points for PRA >80)

OPTN **UNOS** United Network for Organ Sharing

The current system

- Waiting time (1 point/year)
- HLA matching (2 points for DR)
- Sensitization (4 points for PRA >80)

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What is wrong with the current system?

Poorly adherent to the Final Rule

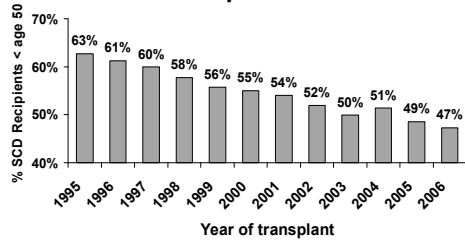
- Does not *seek to achieve the best use of donate organs*
- Is not *designed to avoid wasting organs*
- Does not set *priority rankings expressed, to the extent possible, through objective and measurable medical criteria*
- Most kidneys are now allocated based mostly on waiting time

Currently there is no real "Goal" of kidney allocation

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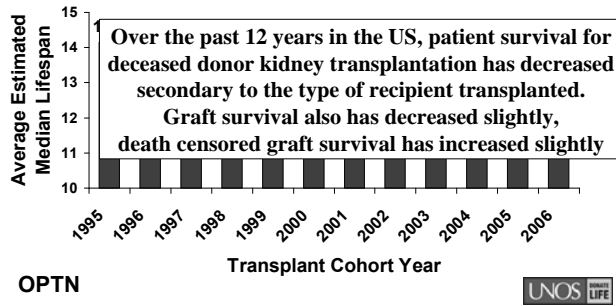
Decline in Percentage of Standard Criteria Kidneys to Younger (< 50 Years of Age) Recipients



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Decline in Average Post-Transplant Patient Lifespan Among SCD Kidney Transplant Recipients



If we want to change the current system, how can we do it?

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Two Big New Concepts

- Changes in ranking donor kidneys:
 - Donor Profile Index (DPI)
- Changes in ranking candidates:
 - Life years following transplant (LYFT)
 - Accumulated Time with renal failure

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Ranking Donor Kidneys: **Extended Criteria Donors (ECD)**

- Recognized that kidneys from different donors have different chances for long-term function
- Extended criteria donor system—age, serum creatinine, hypertension, stroke as cause of death
- Goal to increase efficiency, increase patient choice - Increase transplant rate of ECD kidneys
- Crude — Good kidney / Bad kidney system

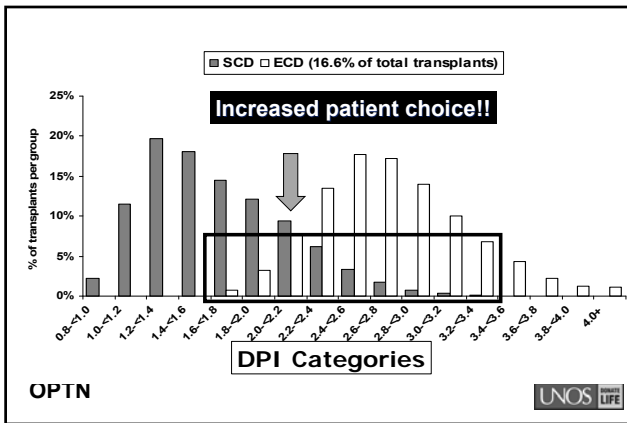
Ranking Donor Kidneys: **Donor Profile Index (DPI) Continuous score with more variables:**

Table 2.1: Definition of DPI

DPI factor	Parameter
Donor age	-0.02060
Donor age - 18 spline	0.03407
Donor female	0.05446
Donor Black	0.16022
Donor HTN	0.10346
Donor DM	0.18749
Donor creatinine	0.14307
Donor creatinine - 1.5 spline	-0.14319
Donor cause of death = CVA	0.05739
Donor height (cm, log)	0.01409
Donor weight (kg, log)	-0.22400
Donor weight - 80 spline (kg, log)	0.20938
DCD	0.07665
ECD	0.09151
Donor cigarette history	0.03994
Donor HCV positive	0.39732

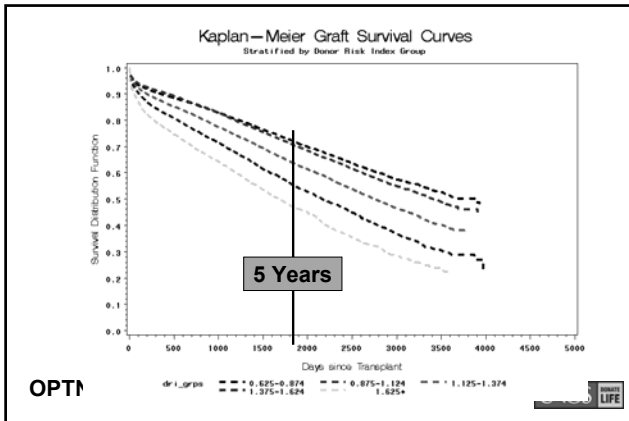
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Changes in Ranking Candidates

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New Allocation Schemas

- Liver → MELD
- Heart
- Lung
- All have in common—no other life-saving therapy except transplant
- All primarily focused on preventing death on the waiting list and maximizing early post-transplant survival (1 month to 1 year)

Kidney is different

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End-Stage Renal Disease in USA

- Dialysis = 300,000 people
- Living donor kidney transplant = 6600/yr
- Deceased donor kidney transplant = 10,000/yr
- Mortality not directly related to lack of an organ
- Mortality related to co-morbidities and dialysis-related deterioration
- Candidates with highest wait-list mortality generally have poorest long-term survival

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What is the goal of a kidney transplant?

- Freedom from dialysis All patients with a successful transplant
- Better quality of life Most patients, poorly measured
- Prolongs life compared to dialysis

Most patients, objective

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Transplant Vs Dialysis Survival

New Term

Life Years from Transplant
(LYFT)

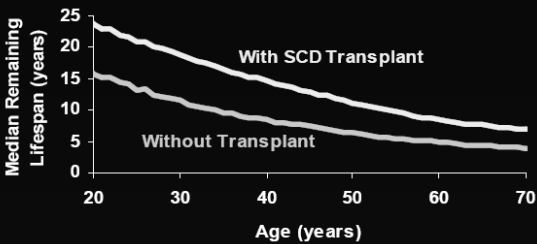
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Life Years From Transplantation LYFT

- LYFT is the number of **extra** years of life that a candidate could expect to live with that donated organ compared to without a transplant.
- Example: Based on patient and donor characteristics the remaining lifetime might be estimated as:
 - 15 years with this transplant and
 - 5 years without transplant.
 - **LYFT = 15 - 5 = Ten extra years of life**

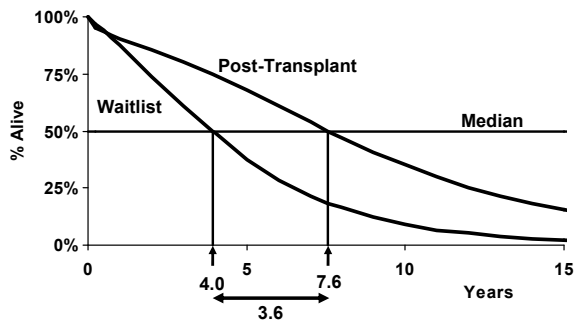
Median Survival by Age

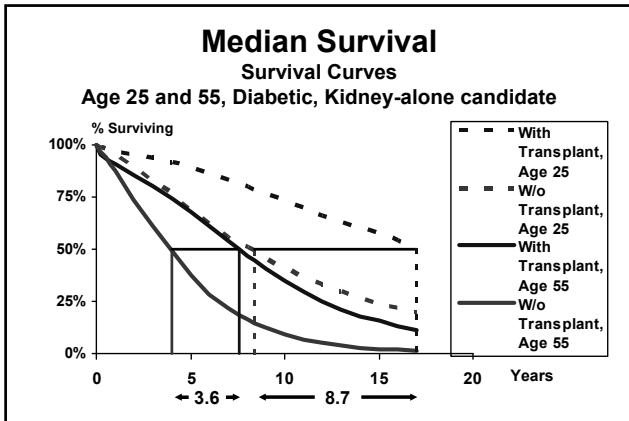


Median lifespans with average SCD kidney and without any transplant are based on average of median survival estimated for candidates active on the waitlist on 1/1/2004.

Slide 49

Median Survival And LYFT Age 55, Diabetic, Kidney Candidate





Developing the LYFT Model

- Time 1/1/92-12/31/04
- 110,777 adult Kidney and SPK candidates
- 96,275 transplants
- Extrapolated survival—Post Tx and WL

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V **Variables excluded:**
gameable, poor data or not a major factor

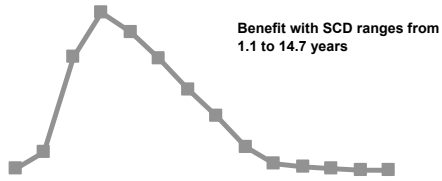
- Age
- Diabetes
- Peripheral Vascular Disease

Including the diagnosis of the candidate (ex. PKD) had a negligible impact on LYFT Score

- Albumin
- BMI
- Previous Transplant
- Peak PRA
- Ethnicity/Race
- Angina
- Primary Insurance Status
- Drug Treated Hypertension
- Type of Dialysis
- BSA (Surrogate for Geography)
- DONOR FACTORS—age, HLA, cause of death

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Distribution of LYFT Among Candidates Active on 1/1/2004



Survival is not everything

- What about quality of life?
- Life on dialysis is of lower quality than life with transplant

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Quality of Life (QoL) for Candidates and Recipients

- LYFT could value post-transplant years and waitlist years equally
- However, several published studies indicate that QoL is lower on dialysis than with a functioning transplant
- Appropriate emphasis to post-transplant survival with a functioning graft can be incorporated into transplant benefit calculation in order to account for this difference:
 - Adjustment factor of 0.8 obtained from published literature
 - All candidates receive the same QoL adjustment

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QoL Sources: What is the relative value of dialysis years vs. years with functioning graft?

- Laupacis et al. (1996, Kidney International).
 - Time trade-off analysis
 - 168 Canadian patients
 - Ratio varies by time since transplant from 0.76 – 0.84
 - 0.80 seems a reasonable overall value
- Hornberger et al. (1997, Med. Decis. Making)
 - Health state value
 - 878 patients
 - Ratio = 0.81

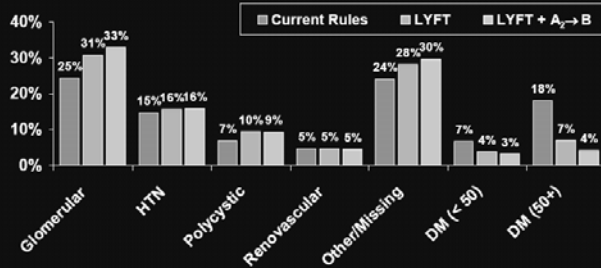
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Quality of Life (QoL) - Adjusted LYFT

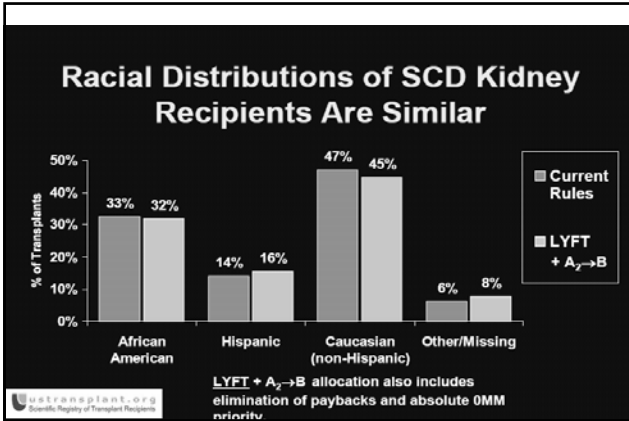
- QoL adjustment weights dialysis years by 80%:
 - Transplant Lifetime (QoL) = Years with functioning graft + 0.8 * Dialysis Years after graft failure
 - Non-Transplant Lifetime (QoL) = 0.8 * Dialysis Years
- QoL adjusted LYFT is the difference between the adjusted lifetimes.
- Simulations use QoL adjusted LYFT

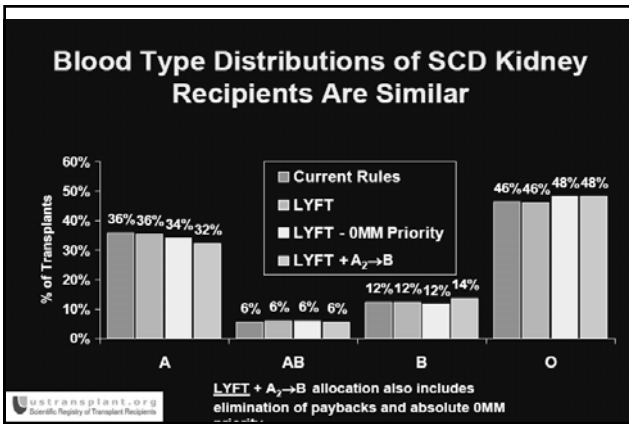
Distribution of Diagnoses of SCD Kidney Recipients Changes When LYFT Is Used



LYFT + A₂→B allocation also includes elimination of paybacks and absolute OMM

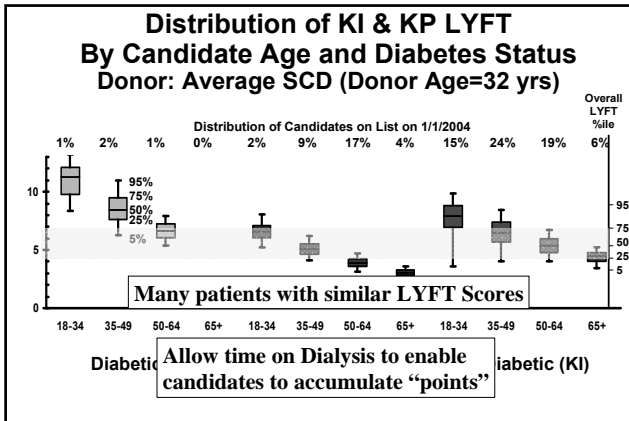


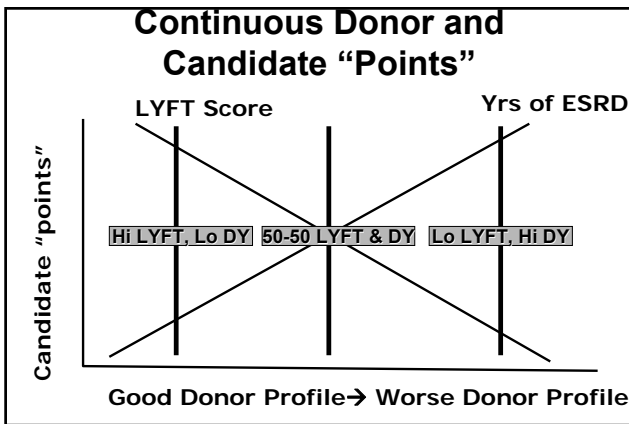




Fewer Retransplants

- One of the possible benefits of longer graft survival is fewer retransplants will occur over time
- Fewer retransplants may result in more kidneys for other candidates





Outcomes When LYFT is Modified by Alternative Allocation Priorities

	Current	LYFT alone	A2→B PB/OMM	Continuous DPI	DPI LYFT> Time
Years after transplant	113,541	139,334	145,960	131,279	139,215
Years with graft	75,940	85,388	86,414	78,424	82,026
Total extra life years	43,940	55,397	58,468	50,507	55,017
Δ Years after transplant		25,794	6,626	-15,069	-7,133
Δ Years with graft		9,448	1,026	-7,815	-4,154
Δ extra life years		11,457	3,071	-7,268	-2,759

Public Forum

Bidirectional Flow of Information

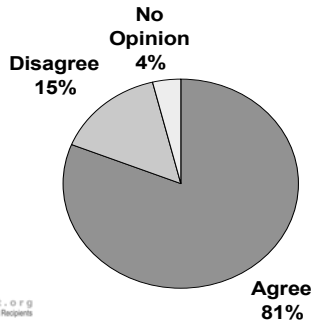
- Presentations by Committee Members and SRTR
- Public Testimony
 - 3 patients
 - 3 transplant professionals
 - 1 operations researcher
- Participant feedback through small group discussions

500+ people participated in the forum: 250 in person participants, 66 Live Meeting connections, and 147 phone connections

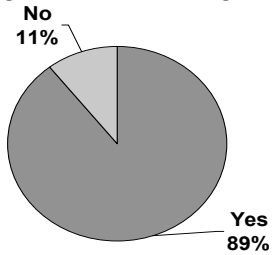
Attendees answering questionnaire

• Nephrologist	8
• Surgeon	17
• OPO Representative	5
• Transplant candidate	1
• Transplant recipient	6
• SRTR staff	2
• Government employee	2
• Other	17
• <u>Not marked</u>	<u>15</u>
Total	73

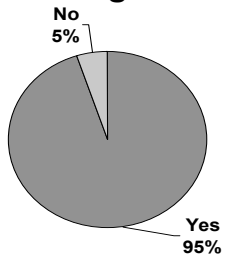
Should the current system be changed?



Should a measure of LYFT be incorporated into the new kidney allocation system?



Should LYFT be modified to provide some priority for waiting time?



Feedback from Public Forum

- **Specific policy recommendation—Make donor “score” continuous rather than current ECD/SCD**
- **Improve Communication—Hone message and make it simpler**
- **Make methods of LYFT public—OPTN website and peer review publication**

To accommodate other goals, how much decrease in LYFT

– No decrease is acceptable	20%
– Less than 500 life years	2.5%
– 500-1,000	20%
– 1,000-5,000	36%
– 5,000-10,000	15%
– 10,000-15,000	2.5%
– >15,000	5%

Insights From A Recipient Participant

- **Complex problem with no “right” answer.**
- **Long process with careful deliberation.**
- **Genuine interest by those involved to “do the right thing”.**
- **The current system doesn’t work.**
- **Consensus for LYFT as basis for new allocation system.**
- **Can’t ignore the number of years lived by real people under a new system.**
- **What do the donor families think?**

Input

- Public input is the cornerstone of OPTN policy development
- First, become informed about the policy development process and the concepts under consideration by visiting www.optn.org/kars.asp. The site is updated frequently, so check back often.

Input

- You can provide feedback by e-mail by sending a message to kidneypolicy@unos.org.
- Your e-mail will be forwarded to the Committee to review during its next meeting.

Input

- Attend a Regional Meeting. Members of the Committee are giving a presentation about this work at each Regional Meeting.
- These members can relay your comments back to the Committee for consideration.
- A list of regional meetings may be found at www.unos.org. These meetings are open to the public.

Input

- The Committee will hold a second public forum which you can attend. The purpose of this forum will be to obtain feedback on a proposal once one is developed. A specific date and location have not been identified, but we anticipate that the forum will take place during Fall 2007. Please visit www.optn.org/kars.asp for more information as it becomes available.

Input

- Finally, you can submit feedback through the public comment process once a proposal is completed. Sign up to receive public comment notices at <http://www.optn.org/policiesAndBylaws/publicComment/maillingList.asp>.

Likely Elements of Proposal...

- Increase overall LYFT (but not to the max)
- Include continuous donor profile index
- Possible LYFT and DPI “quintile” preferential matching (not exclusive)
- Incorporate time on dialysis in some way
- Include A2 -> B
- Zero MM sharing for high PRA pts. only
- Eliminate paybacks

Path Forward & Opportunities to Provide Feedback

- **Kidney Committee to meet in August 2007**
- **2 Public Comment Cycles**
- **Regional Meetings**
- **2nd Public Forum to be held during Public Comment process**
- **Board Consideration**
- **kidneypolicy@unos.org**

Conclusions

- **Most patients benefit from kidney transplant**
- **Depending on how it is measured, the benefit varies significantly**

Conclusions

- **Modeling patient survival with transplant vs survival on dialysis (LYFT) is a useful method of comparing benefit**
- **Modifying for quality of life is possible**

Conclusions

- Allocating deceased donor kidneys based on a combination of donor kidney quality, LYFT and time on dialysis increases the total utility of the limited number of kidneys while maintaining transplantation across a wide variety of LYFT scores.

Stay Up to Date

<http://www.optn.org>



Analytical Methods for Kidney Allocation Policy Development

The OPTN Kidney committee is evaluating a variety of different approaches to kidney allocation. The medical outcome of expected patient survival, both with and without a transplant, is of key importance in the evaluation of these approaches. These two expected lifetimes are used to compute the Life Years From Transplant, or LYFT, which is the estimated number of additional life years that a specific kidney (or kidney-pancreas) would give a candidate. The following papers document the analytical methods and theoretical support for the calculation of lifetimes with and without transplant and of LYFT, along with the role of LYFT in allocation systems. All of these papers are draft working papers of the SRTR and several are actively being revised, as methods are refined to address new issues.

Calculating Life Years From Transplant (LYFT): Methods for Kidney and Kidney-Pancreas Candidates

Predicting the Life Years From Transplant (LYFT): Choosing a Metric

Extrapolation Methods: Approximating the Median Survival Time Beyond the Duration of Follow-Up Based on Geometric and Linear Growth in Death Rates

Avoiding Statistical Bias in Predicting the Life Years From Transplant (LYFT)

Methods for Discounting Median Lifetimes

Transplant Allocation to Optimize Total Lifetime
The Kidney-Pancreas Simulated Allocation Model (KPSAM) User Guide can be found [here](#).

Thank You
